High Emissivity Ceramic Coatings Formed on Light Metals by Microarc Oxidation: Microstructure and Heat Dissipation Property

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Abstract An infrared emissivity coating material containing γ-Al_2O_3 was prepared on Al alloy surface by the microarc oxidation (MAO) method. Results show that the infrared emissivity values of coated Al samples depend on the phase composition and surface roughness of the coatings. Corresponding to increasing coatings thickness, the gradually increasing γ-Al_2O_3 content and some oxide compounds containing Si and P contribute to the higher infrared emissivity value (about 0.85) in the wavelength range of 8–20 μm. The increasing surface roughness leads to an obvious increase in emissivity from 0.2 to 0.4 at wavelength 3–5 μm. The high emissivity coating coated on the chip surface, it has excellent heat dissipation effect, reducing the chip temperature by 8 ° C, and has been successfully applied in high-power LED and 5G base stations.